Submitted by: Terralogic, Inc.

## VIRGINIA GIS REFERENCE BOOK

General Application Category/Sub Application Name:
Public Works/Service Authority – Facilities Mapping

Product /Service/Function Name: Water and Sewer Service Areas

P/S/F/ Description: A basic application to be used by Service Authority/Facility personnel to locate or identify specific water and sewer areas (boundaries), in which the Service Authority/Facility operates or serves customers. The Authority/Facility delineates each area or boundary. In many cases a particular pump station, tank, or other major facility feature defines this area. In its most sophisticated form, the service area may be associated to other facility database and spatial information, such as pipes, valves and manholes. This allows the user to access feature information by service area.

## Product /Service/Function

### 1. Spatial Data

**Spatial Data Definition:** (ESRI, GIS Glossary, 1996) Information about the location and shape of, and relationships among geographic features, usually stored as coordinates and topology. In general terms, spatial data is geographic information.

**Minimum Requirements:** The minimum spatial data required for this basic application includes:

1.) A digital water and sewer service area coverage, maintained in a common CAD or GIS (vector) polygon format.
2.) A digital base map, covering the entire facility service area, including identifiable roads, and other basic framework data layers.

**Optional Requirements:** Optional spatial data requirements for this basic application include:

1.) The use of a more accurate base map, from a source such as aerial photography, surveys or digital orthophotos.
2.) Additional facility information, such as pipes, manholes, valves and other features within each service area.

### 2. Attribute Data

**Attribute Data Definition:** (ESRI, GIS Glossary, 1996) 1.) A characteristic of a geographic feature described by numbers, characters, images and CAD drawings,

typically stored in a tabular format and linked to the feature by a user-assigned identifier.

**Minimum Requirements:** The minimum attribute requirement includes an attribute table for each service area polygon, noting the specific service area name or other unique identifier.

**Optional Requirements:** Additionally, ancillary tables, such as a customer database, can be linked to each service area by service area name. Each ancillary table must house the service area unique identifier so that the attribute table data and ancillary tables can be joined.

**3. Data Acquisition Options (integrated with VBMP digital orthos)**

Each Public Works Department and Service Authority typically document the physical extents of each water and sewer service area. Many departments warehouse these data in digital format. If the boundary location information is available only in hard copy format, the service areas must be digitally captured, probably via hand digitizing onto a basic facility base map.

The integration of these data with the VMBP digital orthophotographs will provide a highly accurate base map for better boundary location or positional analysis. This may require adjusting, or conflating the existing spatial data to the new VBMP orthophotos.

**4. Data Conflation Options (integrated with VBMP digital orthos)**

Conflation is the method whereby a geographic feature is adjusted to fit a more accurate base map. This process can occur in variety of ways, with the least sophisticated being a "best-fit" methodology. The best-fit method is a visual inspection or comparison of a geographic feature's current position to where it is or should be located on the more accurate base map.

Another conflation option includes rubber sheeting, a method using control points or existing boundaries to establish the new geographic position of a feature. Finally, the most accurate method of conflating data includes the use of Global Positioning Satellite technology (GPS), or traditional survey instruments to accurately locate each desired object's physical location.

**5. GUI / Programming Options**

**Graphical User Interface Definition:** (ESRI, GIS Glossary, 1996) A graphical method of controlling how a user interacts with a computer to perform various tasks. Instead of issuing commands at a prompt, the user performs desired tasks by using a mouse to choose from `a dashboard' of options presented on the display screen. These are in the form of pictorial buttons (icons) and lists. Some GUI tools are dynamic and the user must manipulate a graphical object on the

screen to invoke a function; for example, moving a slider bar to set a parameter value (e.g., setting the scale of a map).

GIS software can be modified utilizing a variety of programming languages or scripting languages and may vary depending upon the system architecture. Languages such as Microsoft Visual Basic are commonly used to invoke macros and customized functions such as GIS queries. Commonly used languages include: Visual Basic, C++, Java, HTML, ASP, ColdFusion, JSP, PERL, PHP and CGI.

**6. Internet Functionality and Options**

Internet functionality should include basic GIS functions available in a thin client GIS application, such as ESRI's ArcExplorer (i.e. Zoom In, Zoom Out, Pan, Identify, Query, Thematic Mapping, etc.). Additional functionality may include appropriate hyperlinks to critical and related information on the Internet related to certain queries or operations within the application. A dedicated needs based approach to determine user interface options and functionality is highly recommended before actual application work is to begin.

An Internet application allows the organization to share its spatial and tabular information to all authorized users via a familiar Internet browser interface. This eliminates multiple software license fees. Additionally, the Map Server (Web Server) is the only GIS hardware/software component that would be managed by the local Information Technology Department.

**7. Minimum Technical Requirements**

A basic working knowledge of a leading GIS software, and Internet Browser are required. A Pentium III or greater CPU, with a minimum of 128MB Ram, 16MB video card, is required. A higher speed Internet connection is recommended for a GIS Internet application deployment and analysis. Most leading GIS software is customizable using MS Visual Basic or other common language. It is suggested that the developer have a working knowledge of (at least) Visual Basic before attempting GUI development.

**Optimum Technical Requirements:**

In the case where a local government employs a highly capable Information Technology Department, other languages may be considered, such as JSP, Java, Visual Basic, ASP, and Cold Fusion. In most cases, these languages are related to Internet application development. A web developer with three years of experience should be able to customize and/or develop a unique Internet Map Server application.

## 8. Administrative / Management Requirements

Management concerns will involve technical support, system maintenance and, of course, human resource management issues of a technical product. These issues are minimized if the maintenance and/or hosting of the application are contracted to a GIS application development and hosting organization. Technical and administrative issues become more critical and consuming when developing and/or hosting an application in-house. General expertise in GIS is suggested if outsourcing application development and hosting. In-house application development and hosting will require GIS specialist human resources, advanced web programming human resources, and significant technical material resources (hardware/software).

## 9. Cost – Cost/Benefit

The cost of developing a Water and Sewer Service Area application (in house) is typically under $3,500. 45% of this cost is attributed to the digitization and attribution of each service area polygon. Programming the application, which includes posting custom queries, accounts for the remaining 55%.

This cost/benefit is highly favorable. Essentially all the data is freely obtained or developed in-house. The benefit to the Public Works/Service Authority is intangible. Utilizing this system, the Facility Manager, or Customer Service Representative can provide improved service and in increase credibility.

## 10. Standards / Guidelines Summary

A Service Authority or Public Works Department is concerned with analyzing information within their entire service area boundary. This boundary and the specific water and sewer service areas contained therein, are the only critical spatial data layers that require upkeep. If any area's boundary is modified, or changed, it must be reflected in the application source data. Similarly, if a joined ancillary database table is updated, the application data must reflect the change. Additionally, the maintenance of a general facility base map (roads and other framework data) may be the responsibility of the Service Authority or Public Works Department. However, if the base map was obtained from a third party, such as the County Planner, an update may be available upon request.

## 11. Startup Procedures/Steps

**Application Outline / Blueprint:** Application purpose, interface design, functionality, queries and "look and feel" should be determined and documented as an initial step. Stakeholders should be involved in this step.

**Data Acquisition:** The attribute data should be obtained from the appropriate Facilities Department and normalized. Spatial base map data can be obtained from a variety of sources; the facility, the local government planning /GIS office, the State GIS Office (VGIN), the federal government, and others.

**Sourcing Determination:** Determine entity/entities that will be performing data development functions, application development functions and application hosting functions.

**12. Estimated Time Line and/or Implementation (stand alone) schedule**

The estimated time to develop this application is minimal. This can be as little as one week, to as much as month. Typically this type of application can be developed in approximately 40 hours.

**13. Best Practice Examples in Virginia**

Fairfax County Water Authority
Robert (Bob) Etris, Manager
Engineering and Construction
8560 Arlington Blvd.
P.O. Box 1500
Merrifield, VA 22116-0815
(703) 698-5600